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Risk management and the credit risk premium

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Abstract

This paper shows how the credit risk premium affects firms' optimal hedging strategies. The model predicts that if the credit risk premium is relatively small, firms use convex hedging strategies. If the credit risk premium is relatively large, firms use concave hedging strategies. Firms in between those two extremes use strategies that feature both convex and concave elements, e.g. collar strategies. Finally, firms that are unlevered, invest little and are exposed to few non-hedgeable risks are the most likely to use linear approximations of the optimal strategy. The model replicates essentially all observed hedging strategies in the gold mining industry. © 2002 Elsevier Science B.V. All rights reserved.

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1. Introduction

Financial markets have witnessed a dramatic increase in the variety of risk management products. Given that firms face many different types of exposures,

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such diversity is to be expected. However, it is puzzling that even among firms that face practically identical risk exposures, such as gold producers, we observe a similar diversity in risk management strategies. For example, to manage their exposure to gold prices gold mining firms have been using forward and spot-deferred contracts, put and call options, and gold loans. [1] The resulting risk management portfolios have provided firms with payoff schedules that are linear, concave or convex functions of the future gold price, or payoff schedules that are neither convex nor concave (collars). Fig. 1 demonstrates this variety by depicting the payoff schedules of risk management portfolios of four gold producers. [2]

The objective of this paper is to explain this diversity and to show how a firm should hedge that faces financial constraints. Froot et al. (1993) showed that financial constraints can motivate the use of derivatives. Building on their framework Mello and Parsons (1999) examined what financially constrained firms should hedge (firm value vs. sales vs. net cash flows, etc.). Extending this line of research, this paper derives *how* financially constrained firms should hedge, i.e. what combination of instruments should be chosen, and how other parameters, such as size and direction of positions, strike prices, etc. should be set. Thus, while Mello and Parsons (1999) derive solutions for the optimal hedge ratio, this paper explains why some firms chose convex or concave hedging strategies while others use strategies that are linear or neither concave nor convex.

There are several papers that examine under what conditions firms prefer non-linear to linear hedging strategies. This literature has shown that non-linear strategies may be optimal in the presence of basis risk (Wolf, 1987; Moschini and Lapan, 1995), borrowing or short-selling constraints (Detemple and Adler, 1988), if hedgeable and non-hedgeable risks are correlated (Detemple and Adler, 1988; Moschini and Lapan, 1995; Brown and Toft, 2001), if a firm can make certain production decisions after observing the state of nature (Moschini and Lapan, 1992), if a firm's capital requirement is a non-linear function of the state of nature (Froot et al., 1993), or if a firm minimizes VaR (Ahn et al., 1999). The one insight common to all of these papers is that hedging a non-linear exposure optimally requires a non-linear strategy. Thus, this literature does not explain why firms with practically identical exposures would implement different hedging strategies.

This paper shows that the diversity in non-linear hedging strategies can be explained by differences in firms' credit risk premia or the cost differential

[1] A spot-deferred contract is a forward contract which allows the short to defer delivery. A gold loan is essentially a structured debt contract whose face value depends on the future price of gold. It can be replicated by a standard loan and a short position of forward contracts on gold.

[2] These four cases are representative examples. Most risk management programs in the gold mining industry fit into one of the cases in Fig. 1.